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Journal of the Society of Arts.

FRIDAY, SEPTEMBER 12, 1856.

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PARIS IMPROVEMENTS.

(*Concluded from page* 684.)

3.—Rules for the Determination of the Compensations.

The jury decides upon the *boná fide* nature and tenor of such deeds as may tend to affect the amount of compensation.

In case the "administration" disputes the right of compensation, the jury takes no cognizance of the dispute, which is remitted for adjudication to the proper tribunals, but nevertheless determines the amount of the compensation, just the same as if it were due, and the presiding judge orders the payment of the sum to the suitors' fund[*] until the question is decided.

If the purchase of a portion of certain buildings is necessary for the sake of public advantage, the whole must be bought, if the owners require it at the hands of the jury, and formally declare such to be their intention within certain legal periods.

The case is the same whenever any portion of land is reduced, in consequence of division, to one quarter of its original extent, and if the owner does not possess any adjacent grounds, or the reduced portion does not exceed ten ares.[†]

If the intended works are likely to have the effect of giving an immediate and special increase of value to the remnant of the property, that increase is taken into consideration in valuing for the compensation.

Buildings, plantations, and other improvements give no claim to compensation when, looking at the period at which they were made, or from other circumstances, the jury are satisfied that they were undertaken with a view of claiming a higher compensation.

If the parties refuse to abide by the decision, possession is taken of the property, after due payment of the monies in the suitors' fund.

No payment is made whenever the property is mortgaged or liable to other incumbrances. In such cases the monies due by the "administration" are paid over to the suitors' fund, to be distributed among the creditors, according to the rules of law.

If in the course of six months after the order for taking possession is awarded, the administration does not take proceedings for having the amount of compensation determined, the parties may do so for themselves.

When the question of compensation has been settled, if it be not paid to the owners or to the suitors' fund within the six months ensuing the jury's verdict, legal interest shall be due from the day on which the six months expire.

4.—Sundry Regulations.

If the lands purchased for public works are not used for that purpose, the original owners or their representatives may petition for the recovery of their property.

The price of lands thus coming to be re-sold may be settled by agreement; if, however, the parties cannot come to an agreement, the affair is brought before the jury to be settled in conformity with the above rules. In no case whatsoever is the jury at liberty to fix a price of re-sale higher than that at which the lands were previously purchased.

When the "administration" intends to act in this way, it gives due notice thereof through the usual means of publicity, and a period of three months is allowed to the original owners to make known their determination.

Contractors for public works have the same rights as the public administration, and are liable to the same obligations.

5.—Compulsory Possession in Cases of Urgency.

When it becomes necessary to enter upon possession of lands not built upon, the necessity for immediate possession is proclaimed simply by a decree or ordinance.

When this takes place after judgment for possession has been given, the decree relative to the necessity of the case, together with the legal decision, are both notified to the owners and possessors of the lands, who are summoned to appear before the civil court. The summons allows at least a delay of three days for appearing in court, and must certify the amount of the offers made by the "administration."

On the day fixed upon by the writ of summons, the owner and possessors of the lands are bound to make known the amount of their claims, previous to taking possession of the property. In case of non-attendance on their part, the proceedings are continued notwithstanding their absence, and the tribunal determines the sum to be paid into the suitors' fund.

The court is empowered to go and inspect the premises, or to delegate an agent in its stead, to collect on the spot such information as may determine the value of the lands, and to draw up a report upon the whole matter. The latter operation must be gone through in the course of five days from the date on which the order was issued for that purpose.

In the course of three days after the above report has been deposited in the office, the court awards the sum which is to be paid. The latter consists not only of the principal, but likewise of such monies as shall secure the payment of interest at 5 per cent. for two years to come.

Upon being presented with the document admitting the receipt of the sum by the cashier of the suitors' fund, and a new writ of summons to appear before the end of two days, having been issued, the president gives orders for taking possession.

The court's decision and the president's order are carried into execution forthwith, and cannot be appealed from.

When possession has taken place, any of the parties may sue for the ultimate apportionment of the compensation in the legal form.

If the compensation awarded be above the sum offered, the difference between both sums is also vested in the fund previously alluded to. But this must be done in the fortnight after the jury's verdict, otherwise the proprietor has a right to stop the progress of the works.

In regard to what is termed in England *good-will*, the business done is likewise taken into consideration by the special jury in France. In such cases the claimant's books, ledgers, &c., are brought forward to test the truth of the claim, and the jury either awards the amount required, or a smaller sum, or rejects the claim altogether according to the circumstances.

The improvements now going on in Paris have naturally given rise to numerous claims of this nature. Generally speaking the parties demurred to the offers made by the municipal authorities of Paris, on the ground of insufficiency. These cases are therefore usually brought before the special jury, but the claimants are frequently either non-suited altogether, or find themselves obliged to accept of a sum far inferior to their claims.

The foregoing regulations refer to the mode of procedure in France generally. The following information applies more particularly to Paris and the late improvements there, and has been kindly furnished by Mons. Merruau, Secretary-General to the Municipality of the French metropolis.

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[*] *Caisse des Depots et consignations.* A special office, connected with the public treasury, established for receiving and administering legal and voluntary deposits, the funds of the Legion of Honour, or those belonging to the savings banks, annuities, and other sources, over which it has by law a right of superintendence. Interest accrues at the rate of 3 per cent., and is usually reckoned from the 60th day after the deposit.

[†] 1 are = 100 square metres.

1.—MUNICIPALITY OF PARIS.

The *Conseil municipal*, or municipality of Paris, has an organisation peculiar to itself, and, therefore, different from the other municipalities of the realm. This organisation existed previously to the present system of government.

Organisation.—The whole body consist of forty members, who are all named by the Emperor, and it is presided over by one of themselves, who is likewise chosen by the head of the government.

The two prefects (of police and of the department) have a right to convene the municipality and to attend its meetings; but they enjoy no right of presidency, nor do they vote.

The Secretary-General is elected by the Council.

It is by no means necessary that the mayors of the twelve arrondissements of Paris should be members of the municipality. Practically speaking, in general they are not members of that body.

The municipal sessions are of a double nature:—

1.—*Ordinary* or permanent throughout the year. This is an exception to the ordinary law of municipalities, according to which they are to meet for their sessions four times a year.

The Council is convened by the prefect of the Seine.

2.—Once a year the municipality holds an exceptional or extraordinary session. It lasts a fortnight, and the members are invested for the time being with the rights and privileges of the Councils-General in the departments.

The latter session takes place upon an Imperial decree being issued to that purpose.

The mayors, though not members of the Council, are, however, considered as forming a portion of the municipal body or corps, under their natural presidents, the two prefects. The principal reasons for their exclusion from the Council may be summed up as follows:—1. Their functions are too numerous and absorbing to allow their regular attendance at the sittings. 2. As they are rather to be considered as public registrars (*officiers de l'état civil*), than as real mayors, they may be considered more properly as the agents or delegates of the prefect. 3. Supposing them to be members of the Council by their own right, the Council would thus be formed of two sorts of functionaries, some of whom would be elected* for the whole period of their duties, and others either admitted or excluded according to the will of government. 4. The mayors might form a coalition, so as to secure to their views a majority in the Council. 5. As the mayors are appointed and dismissed by the government, they might not enjoy that complete independence of opinion which is desirable in such a station. 6. It is impossible to liken the mayors of Paris to the other mayors of the realm, where they form, with their *adjoints*, a portion of the municipal Council, because it would be impossible to admit thirty-six mayors and *adjoints* into the Parisian municipality.

Functions.—This body or corporation, under the direction of the prefect, has a right to adopt the necessary measures for the municipal administration of the city. Its various objects may be grouped under the following heads:—registering of births, marriages and deaths—of electoral franchise rights—the national guard, the recruiting of the army, the assessment of taxes, public schools and popular education, the public worship, public charities, regulations for trade and commerce, the legal practice of the medical profession, burials, etc. Many of these duties are delegated to the mayors; but still the superintendence of these matters is placed in the hands of the municipal Council.

Among its functions must be likewise reckoned the police regulations, sewerage, pavement of streets and thoroughfares, inspection of theatres, distribution of water throughout Paris, preservation of the public health, and so forth.*

In order to fulfil these numerous duties, the Council forms a certain number of committees, to whose direction are entrusted the various branches, and to whom are sent up the reports of their sub-agents.

Finances and Revenues.—The principal source of revenue for the Paris municipality lies in the *Octroi*, or town duties paid on eatables and other articles of consumption paid at the gates of the city. This tax brings in a yearly revenue of about 40 millions of francs. To these may be added ten other millions levied upon the public in different forms and ways, which it would be of no interest to detail. Thus we come to a round sum of 50 millions.

The debts of the city of Paris amount to something near 200 millions of francs, the interest of which is partly paid in annuities, and partly in the usual way, like any other loan.

It is, however, a principle with the municipality never to incur a perpetual debt by having recourse to consolidated funds and annuities; they prefer making greater sacrifices, and drawing on a part of their yearly revenue to liquidate their debts by degrees.

Hitherto the financial position of the city has been considered as very flourishing. After every expense had been paid, and a part of the revenue allotted to the gradual extinction of their debts, they were still able to lay by a yearly surplus of seven or eight millions, as a reserve for future contingencies. When the late improvements were resolved upon, this reserve fund amounted to about 50 millions of francs (£2,000,000).

However, the revenues of the city are at present threatened with a deficit, resulting from a late measure, adopted in consequence of the scarcity which has prevailed for the last two years, itself the result of insufficient crops. A few particulars will serve to explain the latter circumstance.

The bakers in Paris form a privileged corporation, who are obliged to have a certain quantity of flour for the supply of the city, which is warehoused at the Corn Exchange. In consequence of the general prices they would have been obliged to raise the price of bread. In order to prevent the disastrous effects of this on the population, the municipality engaged to pay a monthly sum into the hands of the corporation, provided the 4 lb. loaf should be kept down at 40 centimes the lb. In order to repay this enormous outlay to which the city has bound itself (14 or 15 millions of francs), it is intended to keep up the average price higher than usual when abundant crops will allow a general fall of prices. As this measure is to be permanent for Paris, it is hoped that a reserve fund will be thus established in time for future contingencies of the same nature.

Every year the budget is drawn up by the prefect, who submits it to the approbation of the Council. Their vote can alone make it binding, and thus it becomes law for the metropolis.

2.—IMPROVEMENTS OF PARIS.

When the Imperial government resolved upon undertaking the late improvements, it applied to the municipality, in order to obtain its co-operation.

*** Though named by the Government, the latter chooses them from a list of candidates selected by the citizens.**

*** It must be observed that all French communes or municipalities are considered by the law as being in a state of wardship, under the guardianship of the State. Thus they cannot perform, in virtue of their own right, any act which a ward is not allowed to perform, such as buying or selling municipal lands, &c.**

In regard to the Rue de Rivoli, the government offered to pay one-half of the sum for the portion running along the Tuileries and the Louvre, and one-third of the expenses for the remainder.

This was accepted, and the municipality proceeded to the acquisition of the necessary lands in the usual way, according to the general law, which has been detailed in the above pages.

In one respect, however, there was an exception to the general rule. Those mayors of Paris who were concerned in the future improvements, were induced to use their influence with their *administrés*, to dispose them to an amicable settlement of their individual interests. The efforts of the mayors have in most cases proved successful.

Previously, however, to this, the municipality contracted a loan amounting to 50,000,000 francs, which soon realised a bonus of 12 millions. Thus matters began on the part of the city, with a fund in reserve of

about....................................	50,000,000 francs.
Loan..	62,000,000 ,,
Share of the government	50,000,000 ,,
	162,000,000 ,,
	£6,482,000

The re-sale of grounds, and of the materials furnished by the demolitions, produced a profit over the price of purchase. There was thus no loss to the municipality.

Many claims arising out of good-will have been commonly brought before the special jury, and settled to the satisfaction of the municipality.

As the French law authorizes the special jury either to repair in a body to the spot, or to delegate one of its members for the same purpose, no expense is incurred for witnesses.

The costs for legal advice are very moderate, and regulated by the law.

Every detail concerning symmetry, architecture, and thoroughfares, is under the superintendence of the city architects, engineers, agents, &c., and executed according to their directions.

No part of the sums of money offered by the government are to be refunded.

There may be, on the other hand, two cases in which the municipality may have to pay either a very large portion, or the whole of the expenses. Of this two actual examples may be given.

The halles, or general market, has been lately pulled down, and is now in process of rebuilding. As this exclusively affects the interest and health of the city, the government has no share in the undertaking, and the expenses are paid entirely by the funds of the municipality.

But, supposing a road or large thoroughfare to be opened in the heart of the city, thus supplying a communication between one part of the Empire and another, it is considered as an imperial road of the first class, and it thus falls within the sphere of the government, consequently, the municipality is not liable to any outlay on this score. The *Boulevard du Centre*, which is to run down from the Strasburg terminus to the waterside, is an instance of the latter kind.

Again, the Imperial government intends throwing open a magnificent avenue, measuring upwards of 300 ft. in breadth, from the *Bois de Boulogne* to the *Arc de Triomphe*. A general plan of embellishment will be adopted for that part of the city, gardens laid out, &c. As the Parisian population will be greatly benefited by the realisation of these plans, the municipality has consented to come in for a share in the expenses. However, that share will not exceed one-third of the estimated costs, because improvements upon such an extensive scale are looked upon as a private gratification to the Sovereign, which the city corporation has no need to pay for.

THE MANUFACTURE OF IRON AND STEEL WITHOUT FUEL.

At the meeting of the British Association held at Cheltenham during last month, the scientific and industrial world were startled by a process, the invention of Mr. Henry Bessemer, described in a paper under the above title, read by that gentleman at one of the Sections. The process, if not absolutely perfect at present in all its details, seems destined, from what transpired in the discussion of the paper, and from investigations which have taken place since, to produce a revolution in this important branch of national industry. It was thought better to delay the publication of the process in the *Journal* until with it might be given some results of testing and experiment. Mr. Bessemer, in his paper, states that, after being for many years engaged in experimenting on this subject, until his patience was nearly exhausted, he was led to the conclusion that he could produce a much more intense heat without any furnace or fuel than could be obtained by any of the modifications he had hitherto tried, and thus he would avoid, not only the injurious action of mineral fuel on the iron under operation, but he would, at the same time, get rid of the expense of fuel. Some small preliminary trials having been made, which gave unmistakeable signs of success, Mr. Bessemer at once proceeded to carry out his plans on a larger scale, which he thus describes:—

"On this new field of inquiry, I set out with the assumption, that crude iron contains about 5 per cent. of carbon; that carbon cannot exist at a white heat in the presence of oxygen, without uniting therewith, and producing combustion; that such combustion would proceed with a rapidity dependent on the amount of surface of carbon exposed; and, lastly, that the temperature which the metal would acquire would be also dependent on the rapidity with which the oxygen and carbon were made to combine, and, consequently, that it was only necessary to bring the oxygen and carbon together in such a manner that a vast surface should be exposed to their mutual action, in order to produce a temperature hitherto unattainable in our largest furnaces. With a view of testing practically this theory, I constructed a cylindrical vessel of three feet in diameter, and five feet in height, somewhat like an ordinary cupola furnace, the interior of which is lined with fire bricks, and at about two inches from the bottom of it, I insert five tuyère pipes, the nozzles of which are formed of well-burnt fire clay, the orifice of each tuyère being about three-eighths of an inch in diameter; they are so put into the brick lining (from the outer side) as to admit of their removal and renewal in a few minutes when they are worn out. At one side of the vessel, about half way up from the bottom, there is a hole made for running in the crude metal, and in the opposite side there is a tap-hole stopped with loam, by means of which the iron is run out at the end of the process. In practice this converting vessel may be made of any convenient size, but I prefer that it should not hold less than one, or more than five tons of fluid iron at each charge. The vessel should be placed so near to the discharge hole of the blast furnace as to allow the iron to flow along a gutter into it; a small blast cylinder will be required capable of compressing air to about 8lb. or 10lb. to the square inch. A communication having been made between it and the tuyères before named, the converting vessel will be in a condition to commence work; it will, however, on the occasion of its first being used after relining with firebricks, be necessary to make a fire in the interior with a few baskets of coke, so as to dry the brickwork and heat up the vessel for the first operation, after which the fire is to be all carefully raked out at the tapping-hole, which is again to be made good with loam. The vessel will then be in readiness to commence work, and may be so continued without any use of fuel until the brick lining in the course of time becomes worn away and a new lining is required. I have before mentioned that the tuyères are situated nearly close to the bottom of the vessel; the fluid metal will therefore rise some 18 inches or 2 feet above them. It is therefore necessary, in order to prevent the metal from entering the tuyère holes, to turn on the blast before allowing the fluid crude iron to run into the vessel from the blast furnace. This having been done, and the fluid iron run in, a rapid boiling up of the metal will be heard going on within the vessel, the metal being tossed violently about and dashed from side to side, shaking the vessel by the force with which it moves, from the throat of the converting vessel. Flame will then immediately issue, accompanied by a few bright sparks. This state of things will continue for about 15 or 20 minutes, during which time the oxygen in the atmospheric air combines with the carbon contained in the iron, producing carbonic acid gas, and at the same time evolving a powerful heat. Now, as this heat is generated in the interior of, and is diffused in innumerable fiery bubbles through the whole fluid mass, the vessel absorbs the greater part of it, and its temperature becomes immensely increased, and by the expiration of the 15 or 20 minutes before-named, that part of the carbon which appears mechanically mixed and diffused through the crude iron has been entirely consumed. The temperature, however, is so high that the chymically combined carbon now begins to separate from the metal, as is at once indicated by an immense increase in the volume of flame rushing out of the throat of the vessel. The metal in the vessel now rises several inches above its natural level, and a light frothy slag makes it appearance, and is thrown out in large foam-like masses. This violent eruption of cinder generally lasts about five or six minutes, when all further appearance of it ceases, a steady and powerful flame replacing the shower of sparks and cinders which always accompanies the boil. The rapid union of carbon and oxygen which thus takes place adds still further to the temperature of the metal, while the diminished quantity of carbon present allows a part of the oxygen to combine with the iron, which undergoes a combustion and is converted into an oxide. At the excessive temperature that the metal has now acquired the oxide as soon as formed undergoes fusion, and forms a powerful solvent of those earthy bases that are associated with the iron. The violent ebullition which is going on mixes most intimately the scoria and metal, every part of which is thus brought in contact with the fluid oxide, which will thus wash and cleanse the metal most thoroughly from the silica and other earthy bases which are combined with the crude iron, while the sulphur and other volatile matters which cling so tenaciously to iron at ordinary temperatures are driven off, the sulphur combining with the oxygen and forming sulphurous acid gas. The loss in weight of crude iron during its conversion into an ingot of malleable iron was found, on a mean of four experiments, to be 12½ per cent., to which will have to be added the loss of metal in the finishing rolls. This will make the entire loss probably not less than 18 per cent., instead of about 28 per cent., which is the loss on the present system. A large portion of this metal is, however, recoverable by treating with carbonaceous gases the rich oxides thrown out of the furnace during the boil. These slags are found to contain innumerable small grains of metallic iron, which are mechanically held in suspension in the slags, and may be easily recovered. I have before mentioned that after the boil has taken place a steady and powerful flame succeeds, which continues without any change for about 10 minutes, when it rapidly falls off. As soon as this diminution of flame is apparent, the workman will know that the process is completed, and that the crude iron has been converted into pure malleable iron, which he will form into ingots of any suitable size and shape by simply opening the tap hole of the converting vessel and allowing the fluid malleable iron to flow into the iron ingot moulds placed there to receive it. The masses of iron thus formed will be perfectly free from any admixture of cinder, oxide, or other extraneous matters, and will be far more pure and in a forwarder state of manufacture than a pile formed of ordinary puddle bars. And thus it will be seen that by a single process, requiring no manipulation or particular skill, and with only one workman, from three to five tons of crude iron passes into the condition of several piles of malleable iron in from 30 to 35 minutes, with the expenditure of about one-third part the blast now used in a finery furnace with an equal charge of iron, and with the consumption of no other fuel than is contained in the crude iron. To those who are best acquainted with the nature of fluid iron, it may be a matter of surprise that a blast of cold air forced into melted crude iron is capable of raising its temperature to such a degree as to retain it in a perfect state of fluidity after it has lost all its carbon, and is in the condition of malleable iron, which in the highest heat of our forges only becomes a pasty mass. But such is the excessive temperature that I am enabled to arrive at with a properly-shaped converting vessel and a judicious distribution of the blast, that I am enabled not only to retain the fluidity of the metal, but to create so much surplus heat as to re-melt the crop-ends, ingot runners, and other scrap that is made throughout the process, and thus bring them without labour or fuel into ingots of a quality equal to the rest of the charge of new metal. For this purpose a small arched chamber is formed immediately over the throat of the converting vessel, somewhat like a tunnel head of the blast furnace. This chamber has two or more openings on the sides of it, and its floor is made to slope downwards to the throat. As soon as a charge of fluid malleable iron has been drawn off from the connecting vessel, the workman will take the scrap intended to be worked into the next charge, and proceed to introduce the several pieces into the small chamber, piling them up around the opening of the throat. When this is done he will run in his charge of crude metal, and again commence the process. By the time the boil commences the bar ends or other scrap will have acquired a white heat, and by the time it is over most of them will have been melted and run down into the charge. Any pieces, however, that remain, may then be pushed in by the workmen, and by the time the process is completed they will all be melted, and ultimately combined with the rest of the charge, so that all scrap iron, whether cast or malleable, may thus be used up without any loss or expense. As an example of the power that iron has of generating heat in this process, I may mention a circumstance that occurred to me during my experiments. I was trying how small a set of tuyères could be used; but the size chosen proved to be too small, and after blowing into the metal for one hour and three quarters, I could not get up heat enough with them to bring on the boil. The experiment was therefore discontinued, during which time two-thirds of the metal solidified, and the rest was run off. A larger set of tuyère pipes were then put in, and a fresh charge of fluid iron run into the vessel, which had the effect of entirely remelting the former charge; and when the whole was tapped out it exhibited, as usual, that intense and dazzling brightness peculiar to the electric light." * * * * *

"Before concluding these remarks, I beg to call your attention to an important fact connected with the new process, which affords peculiar facilities for the manufacture of cast steel.

"At that stage of the process immediately following the boil, the whole of the crude iron has passed into the condition of cast steel of ordinary quality; by the continuation of the process the steel so produced gradually loses its small remaining portion of carbon, and passes from hard to soft steel, and from soft steel to steely iron, and eventually to very soft iron; hence, at a certain period of the process, any quality of metal may be obtained; there is one in particular, which by way of distinction I call semi-steel, being in hardness about midway between ordinary cast steel and soft malleable iron. This metal possesses the advantage of much greater tensile strength than soft iron; it is more elastic, and does not readily take a permanent set, while it is much harder, and is not worn or indented so easily as soft iron; at the same time it is not so brittle or hard to work as ordinary cast steel. These qualities render it eminently well adapted to purposes where lightness and strength are specially required, or where there is much wear, as in the case of railway bars, which from their softness and lamellar texture soon become destroyed. The cost of semi-steel will be a fraction less than iron, because the loss of metal that takes place by oxidation in the converting vessel is about 2½ per cent. less than it is with iron; but, as it is a little difficult to roll, its cost per ton may fairly be considered to be the same as iron; but, as its tensile strength is some 30 or 40 per cent. greater than bar iron, it follows that for most purposes a much less weight of metal may be used, so that taken in that way the semi-steel will form a much cheaper metal than any that we are at present acquainted with."

"In conclusion, allow me to observe, that the facts which I have had the honour of bringing before the meeting have not been elicited from mere laboratory experiments, but have been the result of working on a scale nearly twice as great as is pursued in our largest iron works, the experimental apparatus doing 7 cwt. in 30 minutes, while the ordinary puddling furnace makes only 4½ cwt. in two hours, which is made into six separate balls, while the ingots or blooms are smooth even prisms, 10 inches square by 30 inches in length, weighing about equal to 10 ordinary puddle balls."

The advantages claimed by Mr. Bessemer, irrespective of greatly diminished labour, time, and cost of production, are ingots of malleable metal, free from the hard and steely parts found in puddled iron, pure and homogeneous in quality, requiring less rolling for development of fibre, inasmuch as there is no cinder to be expressed. The size of the ingots, too, enables merchant bar or rails to be formed without welding numerous separate pieces together, as is the case at present, owing to the limited size of the puddle balls. A simple inexpensive mechanical and chemical process is substituted for "puddling," probably the hardest and most severe labour to which the human frame is subjected. Whether all the qualities which Mr. Bessemer claims for his process can be established, experience alone can show. Enough, however, has been done to make it clear that the iron industry of the country can no longer be conducted on its present system. A great change is at hand.

Subsequently to the reading of the paper, the process has been put to a practical test on Mr. Bessemer's premises, Baxter-house, St. Pancras-road, in the presence of several ironmasters, practical engineers, and scientific gentlemen resident in London, including several members of the Society of Arts.

In conducting this experiment, 6 cwt. 3 qr. 18 lb. of molten iron from a furnace were poured into the fire-brick vessel, already described, at 12 minutes past 1 o'clock, the blast having been applied at a pressure of about 8lb. per square inch, and continued until 27 minutes past 1. The mass of metal began to boil up, and the cinders and other impurities were extruded from the top of the vessel by two apertures provided for the purpose. Showers of brilliant sparks were thrown off during this process, which lasted several minutes, and as the object was to produce a mass of cast steel, rather than continue the process to the extent necessary for making pure iron free from carbon, the vessel was tapped at 36 minutes past 1 o'clock, and the contents drawn off. Small specimen ingots being first taken, the general mass was run into an ingeniously contrived mould concealed in the floor in front of the apparatus, and, after remaining there a few minutes, cooling down, it was raised out of the mould in a red-hot state, and placed upon a weighing machine. The ingot thus produced, with the two specimen ingots, weighed 6 cwt. Without the aid of fuel this mass of material was converted in 24 minutes from crude cast iron as it comes from the blast furnace into steel.

The experiment was considered by those present as extremely satisfactory.

Mr. Bessemer states that hitherto the finest qualities of iron have always been imported from Sweden and Russia, and these are now sold in this country from £20 to £30 a-ton; but, by the new process, iron can be manufactured, of equal quality, at a cost of £2 per ton less than the present cost of common English iron. If this statement be borne out by the experience of his invention, England will no longer be dependent on the foreign market for the production of iron of the finest quality.

Mr. James Nasmyth, himself the inventor of a process for passing a blast of steam through the molten crude iron, has expressed his opinion of the enormous value of the process, which, in a letter to the *Times*, he says, promises to establish "a new era in a most important branch of our manufactures;" whilst Mr. Bessemer has, with great candour, publicly admitted, before the members of the mechanical section of the British Association, at the late meeting at Cheltenham, that it was this process that has led him to his invention.

Mr. W. Bridges Adams, in a letter to the *Times*, says that there are four patents bearing on this question.

Walker and Warren, dated May, 1853, who claim "a moveable containing vessel, or furnace, employed for the purpose of agitating and consequently "puddling the liquid metal;" that is to say, the metal while in agitation is exposed to the lambent action of flame, air, or gases.

James Nasmyth, May, 1854.—The claim in this is for forcing steam or water through a hollow stirring-rod into the body of molten iron, whereby the steam will be "reduced to its elements and yield oxygen."

Joseph Gilbert Martien, of New Jersey, September, 1855. —The claim is "for purifying iron from a blast furnace, or a refinery furnace, while still in a melted state, as herein described."

Mr. Martien, in his provisional specification, says, that his invention consists "in the application of atmospheric air by mechanical pressure, or of water, vapour of water, or steam (more especially steam) below the surface of the said melted metal as it comes from a blast or smelting furnace or finery fire, so as completely to search and penetrate every part of the said metal. It may be necessary under some circumstances to continue the heat for a time to the liquid or melted metal for the more effectual treatment by the action of atmospheric air, water, vapour of water, or steam, or either. * * * It may then be conducted, after such treatment, directly, and without material loss of heat, to a reverberatory or other furnace or furnaces, and there subjected to intense heat and manipulation and speedily converted into balls of malleable metal of iron and steel."

The *modus operandi* is a channel or gutter of any suitable material, but by preference of cast iron. This gutter is perforated with numerous holes. "When hot blast or cold blast is used, I prefer to connect the hollow bottom of the gutter with the air pipes used for supplying the blast, and, when steam is employed, I connect the hollow bottom of the gutter with the boiler used." Moulds or beds may be used instead of the gutter, and "the iron thus purified may be allowed to cool in the moulds, or may be run from the gutter, channel, or receiver, into a reverberatory or suitable furnace, to be highly heated therein, and may be puddled in the ordinary manner."

Henry Bessemer, January, 1856, contains several methods of aërating molten iron, but not the method used.

Henry Bessemer, March, 1856, is not yet specified, but will, no doubt, contain the actual process.

The experiments detailed in the following letter will be read with interest:—

Royal Arsenal, Woolwich, Sept. 9, 1856.

MY DEAR SIR,—It may interest you to hear of a few experiments made on the iron produced by Mr. Bessemer, made according to the process now so familiar to all. First, as to mechanical tests—

1. A mass of iron, about 15 inches long by 6½ square, made from Blaenavon pig, just as it came from the iron mould into which it had been poured, was heated in the scrap forge, and reduced to a conveniently-sized "bloom" under a one-ton Nasmyth hammer. The appearance of the fracture of this mass, before heating, was similar to that usually described, viz., crystalline, porous, and of a brilliant lustre.

2. The bloom worked very stiff and rigid, and when sufficiently reduced was passed through the rollers, and made into a bar 2 inches wide by 5 thick. Cut with the shears when hot, a good incision was made to about one-third of the thickness, and the remainder fractured in the operation. Another portion of the same bloom was hammered into a short inch square bar under the same hammer, and when cut hot presented the same result.

3. When cold, the first-named bar, once hammered and once rolled, had a nick cut all round, and was broken short off on receiving a blow with a hammer. The fracture clean, laminated as if the crystals were squeezed by the pressure into horizontal layers; no fibre.

4. The two portions faggotted, heated, and hammered into a cylinder of 1 inch diameter; nicked all round, broken with a blow, a clean fracture, no fibre, the first crystalline appearance *restored*, as if the crystals had been simply pressed back by hammering in a direction contrary to the first.

5. The two portions faggotted, heated, and hammered to the same dimensions, a slight nick made on *one* side, fractured by a blow, with the same result. Impressions of the fractured ends were taken in lead, and when compared, at each fracture, had the same appearance, with no increase of fibre.

6. One portion of the last made bar accurately turned, and placed in the machine for testing the tensile strain. A portion of the fracture had an oxidised appearance, which portion was the first to give way, and without appreciable elongation. The iron worked harsh and rigid under the hammer, but well and pleasantly in the lathe. My experiments having been generally with cast iron, I regret not having many with wrought iron for comparison, but you will easily supply them.

The diameter of the specimens at the line of breakage = ·6-inch.

The breaking weights are the means of two specimens, except in that by Bessemer's process, one only being tested.

	NATURE.	Breaking weight in lbs. per square inch.	Elongation before fracture.	Diminution of diameter before fracture.	REMARKS.
			Inch.	Inch.	
Wrought iron made from	Magnetic ore of Londonderry, Nova Scotia	66,491	.109	.123	Fibrous fracture.
	Catalan bloom, hæmatite and specular ore of Londonderry, Nova Scotia	59,594	.332	.199	Ditto.
	Magnetic ore of Nictau.	67,905	.232	.146	Ditto.
	Shell ore of Nictau......	61,039	.234	.204	Ditto.
Bessemer's process (heated and rolled once, heated and hammered 4 times,) preserving the *laminated* appearance to the last......		65,999	.113	.014	Crystalline partially oxidised.

CHEMICAL ANALYSIS.—A portion of the ingot, taken before making the bloom, selected with great care from a solid inner portion of the mass, so as to avoid cavities, fissures, or fused portions of oxide of iron, &c., was submitted to examination. No silicium whatever was detected. No trace of graphite, or of uncombined carbon. Combined carbon not exceeding 0·3 per cent. Phosphorus 0·44 per cent. Sulphur 0·056 per cent. A similar result was obtained some months ago from a sample produced by the same process by Mr. Bessemer, from another description of iron. Blaenavon iron is comparatively free from these last impurities. For comparison, a pig was taken at random from a heap of Blaenavon iron, which yielded to the same treatment the following comparable result:—Phosphorus, 0·48; sulphur, 0·062.

It appears, therefore, that while the uncombined carbon and silicium had been completely removed by the oxidising process (their oxidisation being probably almost concomitant), the complete removal of the combined carbon is a matter of greater difficulty, and that the phosphorus and sulphur are but little affected. It would appear that when disseminated in small quantities, in a combined state, through large masses of metal, they are difficult of oxidisation, and require longer treatment. It is an interesting question as to how long this treatment may be continued before the mass becomes viscid. In the act of pouring it into the mould, considerable quantities rapidly take up their appearance on the sides of the funnel, as if the tendency of the process was to induce that state. I merely mention this for consideration, and not as supposing the matter is so near complete elucidation that anything definite can be pronounced.

It may be remarked generally that the above results are only applicable to iron treated in *one* way, *i.e.*, to a *certain* iron which has remained a *certain* time under peculiar treatment. Experiments, accurately made, will show whether *time* is not an important element, that is, when the process must be stopped. As regards the iron made under the above conditions, the experiment is so far useful, if these are recorded. But nothing can be said about the system, as we may be entirely ignorant, as yet, of the true treatment required. On the other hand, the editor of the *Engineer*, Sept. 5th, states:—"We may state that we have ourselves seen several specimens of the metal after being rolled, and which presented all the appearance of the best bar-iron." Such a statement from such a quarter, whose duty it is to watch over and record these important matters, enables me gladly to draw the conclusion that there is a system by which the best bar-iron can be made under this process, and perhaps he will shortly favour us with particulars.

Very truly yours,

F. E. W.

P Le Neve Foster, Esq.,
Secretary, Society of Arts.

P.S.—Since writing the above, I see in to-day's *Times* a letter from Mr. Bridges Adams, with these words:—"From that ingot has been forged at the Royal Arsenal, Woolwich, a 'bloom,' subsequently rolled into a *tough* bar 2in. by ½in., bearing all the mechanical indications of the *best charcoal iron.*" The italics are mine. This statement is so clear, that I can only suppose Mr. Adams must perhaps allude to some experiments in the Dockyard (though I cannot hear of any), because no other than the above have been made in the Arsenal.

FRENCH MODEL LODGING-HOUSES.—There is some idea of undertaking a vast enterprise, which is said, according to the *Siecle*, to have received the approbation of the Government. It is, to erect, just within part of the fortifications, 2,500 houses, in groups of fifty, which would thus give fifty villages, each forming a sort of square. Each house is to accommodate six workmen's families, at a rent to each of not more than 150 francs.

METALLIC PONTOON WAGGONS.

The experiments with Mr. Francis's corrugated metal waggons, which were last week submitted for trial before the authorities of Woolwich Arsenal, have been pronounced of so satisfactory a nature, that they have expressed their decision of urging the Government to decide on their introduction for all the purposes to which they may be applied. Sir George Pollock, Sir Frederick Abbott, Major-General Brooke, Colonel Tulloch, and many other scientific officers, have expressed their opinion that if the metallic waggons were introduced into our public services, they would prove of incalculable value.

BRIDGE BUILDING.

A correspondent in the *Builder*, under the signature of "Oliver P.," writes as follows:—

"Permit me to say, in some corner of your journal, that the articles you have given on bridge foundations have led me to think whether it might not be possible even yet to construct foundations, where desired, literally imperishable.

"Now I fancy that, within a coffer-dam, a pile of *unburnt* bricks might be raised, in proper order, with breeze, treated as a clamp, of the size and form for the required foundation, to a little above the high-water mark, and *then* burnt to a heat beyond that required for bricks, so that all might *unite together*, as we sometimes see a few accidentally joined in the firing. Then the air channels might be grouted with fine concrete, to make the bed more solid, and prevent the sub-earth rising into them.

"Or perhaps our giant engineers would as readily build and burn it on a floating iron platform, and then sink it gradually; in which case the town might be saved the nuisance of the firing, by its being done elsewhere, and floated afterwards to its place.

"Now, if this be practicable, instead of placing dependence on rotting timber, or on decaying stone or rusting iron, it might be reposed in a fire-made rock that would defy both current and cannon as long as the existence of the people it serves.

"Although apart from this point, may I name another thought? I do not suppose it new; that of forming a platform in the centre of the pier, suggested by the frequently perforated arch, for a steamers' landing-place, connected by stairs with the road level of the bridge, so as to serve for either side of the water."

Colonial Correspondence.

HONDURAS INTER-OCEANIC COMMUNICATION.

Sir,—The Central American question, which at one period bore so threatening an aspect, appears to be now definitively and satisfactorily adjusted, and there is every reason to hope and believe that there will be no further agitation upon the subject. It is said that a treaty has been entered into between Great Britain and the United States, the effect of which will be a concession by the former power of Ruatan and the other islands in the Bay of Honduras, recently denominated the Bay Islands, to the Republic of Honduras, and an engagement on the part of the latter, if not actually expressed, yet clearly and distinctly understood, that they will not, as a *Government*, whatever may be the disposition of such individuals as those who constitute the Cass and Cushing genus, interfere with our rights in British Honduras, that title being attached to the whole of the country lying between the rivers Hondo and Sarstoon, besides an extent of territory inland which has never yet been properly surveyed. Perhaps it would have been better, having the example of the Clayton and Bulwer treaty before us, to have had no "understandings" in the matter, but to have had everything clearly and unmistakeably expressed.

It is also reported that the representatives of Great Britain have signed, or will sign, a convention with the Republic of Honduras, by which she agrees to give up to her Ruatan and the other islands, on condition that the constitution given to them shall not be infringed, that the administration of justice taken from the English model shall not be interfered with, and that no import duties shall be imposed upon any goods entering their ports for the purpose of raising a revenue, but only such dues shall be exacted as may be necessary for supporting and regulating harbours, and constructing and maintaining lighthouses. The inhabitants of Ruatan will, therefore, be in precisely the same position in respect to their laws, their rights and privileges, as when they were under the dominion of the British Crown; and Honduras will exercise over them as much, and no more authority, than that which was assumed by Great Britain. In addition to this "Treaty of friendship, commerce, and navigation," there is a separate article in reference to the inter-oceanic railway through the State of Honduras, projected by Mr. Squier, late Chargé d'Affaires of the United States to the Republics of Central America, which article is to have the same force and validity as if it were inserted word for word in the same treaty. This article is one of very great importance to the commercial world, should Mr. Squier's undertaking be conducted to a successful issue. A similar article, it is said, will be concluded between the Republic of Honduras and America, and also between that State and France. By that article the government of Honduras agrees, that the right of way over such road (the inter-oceanic railway), or any other which may be constructed through its territories from sea to sea, shall be at all times open and free to the government and subjects of Great Britain, for all lawful purposes whatever. It also agrees that it will not impose any tolls, duties, or charges of any kind on the transit of property belonging to the government of Great Britain, or on the public mails sent under the authority of the same, nor on the subjects of the British Crown, and also that all lawful produce, manufactures, merchandise, or other property, belonging to the subjects of Great Britain, passing from one ocean to the other in either direction, shall be subject to no import or export duties whatever, or to any discriminating tolls or charges for conveyance on any such road, and shall be secure and protected from all interruption and detention on the part of the said State. It agrees further, that any other privilege and advantage, commercial or other, which is, or may be granted to the subjects, or citizens of any other country, in regard to any such road, shall be also extended to British subjects; and she likewise engages to establish the ports at the extremities of the contemplated road as free ports, for all the purposes of commerce. In consideration of these concessions, in order to secure the construction and permanence of the contemplated road, and to secure for the benefit of mankind the uninterrupted advantages of such a communication from sea to sea, Great Britain recognises the rights of sovereignty and property of Honduras over the line of the said road, and guarantees positively and efficaciously the entire neutrality of the same so long as she shall enjoy the privileges conceded to her. And when the proposed road shall have been completed, Great Britain equally engages, in conjunction with Honduras, to protect the same from interruption, seizure, or unjust confiscation, from whatever quarter the attempts may proceed. Nevertheless, Great Britain, in according her protection to the said road, and guaranteeing its neutrality and security when completed, understands that this protection and guarantee are granted conditionally, and may be withdrawn by her, if she should deem that the persons, or company undertaking, or managing the same, adopt or establish such regulations concerning the traffic thereupon as are contrary to the spirit and intent of this article, either by making unfair discriminations in favour of the commerce of any nation or nations, or by imposing oppressive exactions, or unreasonable tolls upon passengers, vessels, goods, wares, merchandise, or other articles. The aforesaid protection, however, is not to be withdrawn without first giving six months' notice to the Republic of Honduras.

Assuming the feasibility and completion of the projected railroad, the privileges accorded by the Republic of Honduras in that state, to the government and subjects of Great Britain, are of the highest importance, and for the attainment of them the government, it can hardly be denied, have adopted a wise determination to concede to Honduras the Bay Islands, which would have been, no doubt, a perpetual bone of contention between this country and America, and would have been a standing theme for juvenile Casses and rising Cushings, to practise upon their nascent powers of oratory, like the case of "Peebles and Plainstanes" in the outer court. That arrangement is still more satisfactory on account of the security which has been taken, that the constitutional privileges conferred upon the inhabitants of Ruatan shall be continued to them, and that the ports of that island shall be free. By the charter conceded by the government of Honduras to the railway company, to be formed under the auspices of Mr. Squier and his associates, very valuable privileges are granted. It gives the company all lands and natural materials necessary for the purpose,—it provides that the company shall have a free passage over all lands, public or *private*, and it gives them a space of 200 yards on each side of the line of the road. Native labourers employed on the road are to be exempt from civil or military service, and goods and merchandise *in transitu*, are to pass free of charges on the part of the state, with the exception of a nominal sum for registry, to be paid by the company; and baggage of passengers is to pass without examination, or charge of any kind. The charter grants to the company 640,000 acres of land, and gives to them the exclusive right to purchase and locate on the line of the road or *elsewhere*, an additional 800,000 acres, at 12½ cents. (that is 6¼d.) the acre, *payable in the stock of the company at par*. All persons settling on the lands of the company are to be entitled to all the rights and privileges of native-born citizens of the state, *and to be exempt for ten years from all kinds of taxes*, and all civil or military service, except with their own consent.

Furthermore the government agrees to give a bounty of fifty acres of land to each unmarried, and of seventy-five acres to each married labourer, who shall come to Honduras to work on the road, and who shall declare his intention of becoming a citizen. These concessions, conceived in a liberal and enlightened spirit, and evincing a sincere desire of improvement and of keeping pace with the progress of civilized nations, are doubtless of great importance, and will, when made generally known, it is to be hoped, have the effect of attracting European labour and enterprise to the theatre of operations.

The proposed railway is to commence on the Atlantic side, at Puerto Caballos, which is about six miles from the town of Omoa, and terminate at La Union, in the Bay of Fonseca, on the Pacific side. It will be 161 miles in length. After having crossed the rivers Chamelicon and Santiago, it will run parallel with the river Humuya for about 100 miles, and will then pursue the course of the river Goascoran to the bay of Fonseca, into which that river flows. Mr. Squier, in his published report upon this route, informs us that the rivers Humuya and Gascoran, and the plain of Comayagua, constitute a valley from sea to sea almost in a straight line, consequently no excavations will be necessary. From Puerto Caballos there is an inclined plane of 100 miles in length, the summit of which, at Rancho Chiquiti, near the source of the Humuya, is 2,400 feet from the level of the sea. This elevation not being sudden and precipitous, but being, as it is stated to be, a gradual ascent for 100 miles, is no great impediment. The road in its course will pass over a number of smaller streams, which will render necessary the construction of between 30 and 40 bridges. It will take in its way Comayagua, the capital, as well as several minor towns and villages. Santiago, containing a population of 400; Ojos de Agua, 350; Comayagua, the capital, 8,000; San Antonio Villa, 2,500; Lamani, 800; Aguanaterrique, 600; Caridad, 1,000; Saco, 600; and Goascoran, 1,200. It is stated that there is a sufficient depth of water, both in the bay of Caballos and in that of Fonseca, for vessels of a very large burden. This circumstance alone would render the Honduras route preferable to that of Panama as a traffic line. It is an undeniable fact that, in the bay of Panama, vessels of a large size cannot come within several miles of the shore.

The total cost of the Honduras railroad is estimated at 6,436,495 dols. The capital of the company will be 10,000,000 dols., or £2,000,000. The price of the shares 100 dols., or £20 each. The directors will be American and English gentlemen of the highest respectability. Amongst the English directors there will be, I have been informed, the following gentlemen:—William Brown, Esq., of Liverpool, M.P., Chairman; J. L. Ricardo, Esq., M.P., J. C. Ewart, Esq., M.P., Abraham Darby, Esq., W. Dent, Esq., Col. Tremenheere, and Charles Holland, Esq. With respect to these names no observation is requisite.

I have heard the feasibility of the inter-oceanic railway through the State of Honduras broadly denied. I have heard it asserted by gentlemen who have travelled in that country that insuperable difficulties exist in opposition to such a scheme. "Insuperable difficulties" is a strong phrase in these days, and ought not to be inconsiderately employed. Murphy, the translator of Tacitus, declared that a man, whose biography he wrote, was insane, because he projected a vessel which would go without wind; and it is not very many years ago when a distinguished scientific gentleman gave the world distinctly to understand that steam navigation across the Atlantic was an impossibility. In fact, there are few difficulties which energy, determination, science, and money are not able to overcome. Undoubtedly there might be some projects against the accomplishment of which nature would *appear* to oppose insurmountable obstacles. If any man were seriously to propose a mode of journeying to the moon, we might, perhaps, think a quiet corner in that planet the best place for him; or, if a modern Dædalus were to profess to teach the citizens of London the art of flying, which should entirely supersede the use of omnibuses, we should probably think less of clipping his wings than of shaving his head.

But what are these difficulties which will render the Honduras inter-oceanic railway impracticable? First, it is asserted that an unbroken chain of lofty mountains, over which it would be impossible to construct a railway, runs across the whole of the State of Honduras. If this were so there can be no doubt that the practicability of the scheme would be at least questionable. But have the gentlemen who make this statement had an opportunity of forming a correct opinion upon the subject? Or do they arrive at a conclusion with respect to what they have *not* seen, from that which they *have* seen? I very much suspect that the latter is the case. The persons to whom I have alluded, I have little doubt, give utterance to what they believe to be the fact, but all the knowledge which they possess of the country has been obtained during their various journeys to and from the city of Comayagua, performed upon the backs of mules. Now it is a well-known fact that the roads in Central America, which are mere bridle-paths, instead of winding round the base of the hills, which they might often do, take a direct course over the summits of the mountains. I have myself seen three or four hundred mules, laden with merchandise, proceed from Omoa towards Comayagua, like a troop of marching ants, in a direct line up the side of the mountain, when an additional mile or two would have given them a comparatively level road round the base. At Truxillo I have also seen fifty or sixty mules, laden with silver, come over the summits of the hills from the mines in the interior. The road from Ysabal to Guatimala, is the same. It is ascent and descent all the way. What opinion, then, of the general features of the country can those gentlemen form, who have only travelled over these mountain heights? Mr. Squier was nearly twelve months in Honduras, in company with competent surveyors, not merely passing through, not residing in one spot, but going from place to place, and accurately observing the whole surface of the ground. Besides, those persons who constitute the legislature and the government of Honduras must be supposed to know the features of their own country, and if a range of impassable mountains stretches across the whole of that state, it will scarcely be believed that they are unacquainted with the fact. But if such be the case, their conduct is strangely inconsistent with such a knowledge. They grant a charter to the company, they invite immigrants, and encourage them to become citizens of the state, by offering those who are married 75 acres of land, and those who are unmarried 50 acres; and they enter into a treaty, through their accredited agents, with Great Britain, with France, and with the United States, in reference to this very railway, which railway, if the aforesaid impassable range of mountains exist, can never be carried into effect. If the railroad be impracticable, all these treaties, conventions, charters, and solemn forms, are much more ridiculous than was the mountain, when, after much trembling and heaving, it produced its little whiskered offspring.

Another difficulty,—which really exists,—has been mentioned. But it is not one which bids defiance to skill and labour. It is said that during the heavy floods, in the rainy season, all the rivers, and even the smaller streams, are immensely swollen by mountain tributaries, and from sluggish waters, the current of which is hardly perceptible, and from trickling rills they become impetuous torrents, sweeping away everything in their course. This is certainly true. The rainy season in British Honduras, —and I suppose it must be pretty much the same in the state of Honduras,—commences in the month of June and ends about March. From March until the end of May, it seldom rains at all. From June until the month of November, the rain comes from the east, accompanied by strong breezes, and, at the commencement, with incessant thunder and lightning. From November until the latter end of February, the north winds generally prevail, and they frequently bring with them heavy rains, which continue for three or four days, and sometimes for a week at a time. But it must not be supposed that beause the season is called rainy, that there is nothing but rain whilst it lasts. Such is not the fact. At that period of the year, the weather is merely uncertain. There are often long intervals of a month's, or two months' continuance of fine dry weather. During the floods, the rivers, especially towards the source, rise to a great height. I have known them rise 30, 40, and even 50 feet in the coure of 24 hours. The current is then exceedingly rapid and powerful. In constructing the railroad, these circumstances must be borne in mind, and provided against. I do not apprehend that there will be any serious difficulty in doing this, for where the greatest rise takes place, the banks are the highest.

Most of the materials necessary for the undertaking (iron of course excepted) exist in abundance on the spot, or very near to it. Mr. Squier mentions mahogany, lignum vitæ, and oak for cross ties, &c. With respect to the two latter woods I can say nothing,—but he must not calculate upon mahogany; in the first place there is not a sufficient quantity of it; 2ndly, it would be too expensive if there were, (for it must not be forgotten that almost all the mahogany works in Honduras belong to English houses, and the wood would, therefore, not be obtainable without purchase); and 3rdly, it would be the very worst wood for the purpose. No wood is more perishable, when exposed to the action of water, than mahogany. In a very short time it becomes worm-eaten, and presents the appearance of a honey-comb. A great number of coasting schooners and droghers are built of mahogany, but if they were not well coppered, they would very soon be destroyed. It is, however, a very durable wood as long as it is kept dry. The best woods for railway sleepers, &c., of which there is a profusion in British Honduras, and probably in most of the lowlands in Central America, are the red pine and the sappodilla. The pine of Honduras contains more resinous material than the pine of any other country. The worms never attack it, and water only hardens it. The sappodilla is a hard, red, heavy wood, and will last for many years. Building stone, limestone, and an excellent clay for bricks can be procured in any quantity. In Omoa there is a large, strong, Spanish fortress, built of the stone of the country, and in Truxillo there is a similar structure. In the latter town there are the remains of what was once a magnificent episcopal palace, built of brick made of clay found in the neighbourhood. There is also a road which extends for a considerable distance into the country, built with bricks, *which no* doubt were manufactured on the spot. It would be well for the engineers employed on this railroad to give to the subject of brick-making some attention. The bridges, station-houses and other works, might be constructed, in a great measure, of bricks made of the clay of the country. With respect to fuel,—no doubt there is plenty of wood,—but whether or not there is coal, remains to be seen. Upon that subject I shall probably have to address you at no distant period.

The question of labour will demand very serious consideration. M. Alvarado, in a letter addressed to Mr. Squier, dated January 15, 1856, says, "The north coast of Honduras, as you well know, as also the departments bordering on it, have considerable towns peopled by a vigorous race of men, who are thoroughly acclimated, active, and inured to labour, known as Caribs. The almost exclusive occupation of these men is the cutting of mahogany. They are dexterous in the use of the axe, and well instructed in the management of oxen, and in the construction of common roads and bridges. Accustomed to work in the cuttings, under the direction generally of English, or American *empresários*, they have acquired a fair knowledge of the English language, and have been taught to work with method and regularity. It may also be observed of them that they are of good disposition and docile. This class of workmen may be had, on the section of the proposed road, from Puerto Caballos, to the mouth of the Rio Santiago, in number if needed, of from 2,000 to 2,500."

I am sorry to say that I am not able to concur with M. Alvarado in this statement. I have not the least doubt that he believes what he says, but I fear he is labouring under an erroneous impression. There is not the slightest dependence to be placed upon the Carib. He is idle and sullen, and quite incapable of continuous labour. Very few Caribs are employed in the mahogany works, the negro and the Mosquito man being greatly preferred. But, they themselves are indisposed to engage in any occupation which involves the necessity of hard work. Sometimes they are hired as domestic servants, but they never remain long in one place. The love of change is with them a passion. If you happen, to have a Carib servant, he will come to you unexpectedly some fine morning, and say, "Me going to take a walk massa." "Indeed, where are you going?" "Me going to my maamy. Me tired of work. Me go take rest. Me come back byamby." The Caribs have got settlements of their own, where they live by themselves. At a place called Stan Creek, about 20 miles from Belize, there are two Carib towns, one containing about 1,500 inhabitants, and the other 1,000. There is also one near Truxillo, containing about 3,000. These people occupy themselves chiefly in canoe-making and fishing. On the subject of labour, Mr. Follin also addresess Mr. Squier in the following terms:—"It is much to be regretted that we are not ready to begin work at once. Mahogany cutting is nearly abandoned, and 3,000 of the best men in the world for the enterprise can now be engaged at very *low wages*, from 12 dollars to 15 dollars per month, including rations."

To say nothing about the low wages of 15 dollars per month, including rations, which would be 8 dollars more, the statement that mahogany cutting is nearly abandoned, is far from the fact. There is not the slightest symptom of the abandonment of mahogany cutting, nor could M. Follin, at any period of time, have engaged "3,000 of the best men" for the Honduras railroad. All the houses engaged in the mahogany trade to any extent are English, and the labourers employed in that business (who are principally negroes) are invariably hired in Belize. So far from 3,000 labourers having ever been thrown adrift, there has always been, and is now, a complete scramble to secure them. The proprietors of the railway must, therefore, dismiss from their minds all expectation of obtaining negro labour. Indian labour is equally hopeless. The Indians have only been accustomed to agricultural work. They are short in stature, small-limbed, weak, and altogether incapable of the violent physical exertion necessary in railway operations. I know only one class of persons in that country from whom railway labour might be obtained. I mean the Mosquito men, or, as they are more correctly called, *Weikas*. From amongst that people tolerably good navvies could be procured. But they are intensely indolent, and supremely brutal. Of all the human races which inhabit that portion of America, they occupy the very lowest grade on the ladder of civilization—they have not ascended one step. Were it not that they have the power of speech, doubts might exist as to what species they belonged, or credit might be given to Lord Monboddo's theory; however, they *have* a language, such as it is. They are capable of considerable physical exertion, and if a watchful overseer were placed over every fifty or sixty, they might be induced to get through a respectable amount of work. I do not mean (God forbid that I should) that they should be stimulated by the lash. But the Weika is not insensible to kindness; and words of encouragement, with promises of reward, would have more effect with him than blows. But why not take out European labourers? It is an error to suppose that Europeans cannot labour out of doors in a tropical climate. It is true that he cannot bear exposure to the scorching rays of the meridian sun, like the negro, the Indian, or the Weika, but he is able to do much more than all these put together, without injury to his health, if he only times his work. From six o'clock in the morning until ten, and from three o'clock in the afternoon until seven, any European might work with impunity. What is the reason, then, that so many Europeans die? *Because they drink.* Why not, then, drum for recruits in Ireland? Why not blow the horn in Belgium? Seventy-five acres of rich land (with, *perhaps*, a silver mine) to every married, and fifty acres to every unmarried labourer—the bounty which the Honduras government offers, "besides the ating and the dhrinking," would be no slight inducement to Pat.

There is good reason to believe that the Honduras inter-oceanic railroad would be preferred to that of Panama, especially for the conveyance of goods. At the present moment the greater part of general merchandise from Europe is conveyed to Lima, to San Francisco, to Guatimala, to Valparaiso, and other places in the Pacific round Cape Horn. A considerable quantity of cochineal is conveyed from Guatimala on the backs of mules over the mountains to Ysabal. Thence it is sent to Belize, in small coasters, and at Belize it is shipped for England. It is certain that the secure transit, by means of the Honduras railway from Fonseca to Caballos, and *vice versa*, would supersede the perilous journey along the giddy heights of Guatimala, and the long and tedious route by Cape Horn. The settlement of British Honduras could not fail to be greatly benefitted by this railroad. Instead of a small steamer, as at present, going from Kingston to Belize once a month, with the Honduras mails and one or two passengers, the large steamers that now go to Navy Bay, would most probably every fortnight go to Jamaica, from that island to Belize, with all the Pacific passengers on board (many of whom would land to procure fresh supplies), and having delivered the mails, would proceed to Caballos, land their passengers and cargo there, take in fresh goods and specie and passengers for Europe, and return again to Belize on their homeward voyage. All this would necessarily be of great advantage to British Honduras. A fresh impulse would be given to trade, new articles of commerce would be developed; energy and enterprise would be awakened; immigration would commence; and competition would ensue. The natural resources of Honduras are immense, and although the present inhabitants of that region are too blind to perceive them, too apathetic to regard them, or too indolent to utilize them, a new and more earnest people, not prostrated by tropical heats to a state of lethargic inactivity, not lulled to a dreamy repose by the rustling of the sea breeze through the broad leaves of the plantain, or the spreading branches of the shady tamarind, but strong in purpose, vigorous in action, determined in pursuit, would soon discover and avail themselves of riches, which have so long been left ungathered and despised.

I am, &c.,

R. TEMPLE.

25, Bernard-street, Russell-square, Sept. 8, 1856.

Home Correspondence.

THE PURIFYING OF WATER.

Sir,—In reply to the inquiry made by your correspondent, Leonard Rowe Valpy, I would suggest that the cheapest mode of filtering ponds of impure water would be to cause the noxious water to pass through the bank of the pond to a lower level, in the form of a spring or smaller pond. This is extensively practised in the East; and we are told in Baber's "Commentaries" that, by digging in the bed of any nearly stagnant river, we may obtain pure water, and we are informed that when the troops of Cæsar had the cisterns of Alexandria made impure by the enemy, the garrison got drinking water by sinking pits (*Alexandriæ Bellum, Auctore Hirtio*).

Yours, &c.,

GEORGE TWEMLOW,

Colonel Bengal Artillery.

Clapham Common, 7th Sept., 1856.

Proceedings of Institutions.

Burton-on-Trent.—The general meeting of subscribers to the Literary Society was held on the 20th August, when the following report was presented:—"Your Committee have again the satisfaction of being able to report favourably of the progress of the Society. Previously to the last year it had always been found necessary to appropriate part of the following year's subscriptions for the purpose of meeting the current year's expenses, and in some years this was done to a considerable extent.—The balance, however, against the Society had for the last few years been gradually reduced till on the 30th June, 1855, it amounted only to £5 0s. 1d. The Committee have the pleasure to announce that, after making very large additions to the library, and with an increased outlay upon the News Room, at the close of the year ending the 30th June last, there remained a balance in hand of £11 11s. A balance-sheet of the income and expenditure for the past year is appended to the report, and the prosperous condition of the Society which it discloses, cannot fail to be highly satisfactory to the subscribers. The library now consists of nearly 2,000 volumes, no less than 307 having been added in the course of the year. A considerable number of fresh periodicals and magazines have been taken from the Reading-room, and it is confidently hoped that, now the Society is freed from debt, an equal or larger addition may be made annually. The Committee would, however, urge upon the subscribers the importance of individually endeavouring to increase the prosperity and efficiency of the Society, by inducing others to become members of it, as the Committee cannot but remark that the list of subscribers, in proportion to the numbers of the classes in this town for whose benefit it was instituted, is very small. Arrangements will be immediately entered into for securing a regular course of lectures, during the ensuing winter, from some of the most popular lecturers of the day. The Society having joined the Union of Institutions in connexion with the Society of Arts, its members will have the privilege of being admitted to any of the Institutions forming the Union, on producing their tickets of membership with this Society. Such tickets will be immediately issued. To those members whose occupations take them frequently from home, this will be found a great advantage, as Institutions in most of the principal towns in the kingdom belong to the Union."

Manchester.—The Art and Industrial Exhibition with which it was intended to inaugurate the new Mechanics' Institution at Manchester was opened on Tuesday last. Although Lord Palmerston was prevented by a family bereavement from fulfilling his engagement by presiding on this occasion, it was exceedingly well attended by season-ticket holders of a guinea each, and it speaks well for the success of the Exhibition that among the first attendants were many of the leading and most wealthy inhabitants of the town and neighbourhood. There were Mr. Oliver Heywood, president of the Institution, the Lord Bishop of Manchester, Mr. W. Brown, M.P., Mr. Bazley, president of the Chamber of Commerce, Mr. W. Fairbairn, C.E., F.R.S., Rev. Dr. Booth, F.R.S., and others, who have taken a warm interest in the Institution for years past. The principal portion of the company having assembled in the lecture-hall, after the National Anthem had been given by a full choir, accompanied by the organ, Mr. Oliver Heywood, the president, briefly opened the Exhibition in a short address, in which he said, it was the wish of the directors with whom he had been associated in the erection of that building that he should express the gratification and encouragement they derived from the presence of so many friends. They had hoped that their first assembling within those walls would have been under very different circumstances, and it was their wish to connect the opening of the exhibition with the inauguration of the new building, and to avail themselves of the opportunity which the occasion appeared so happily to afford of giving a new impulse to the work in which they were engaged. They thought that the past history of that Institution, which was among the earliest of its class, and which had contributed so largely to the intellectual, social, and moral improvement of the community, might be traced with interest and advantage from its day of small things, during a long and successful career, until when self-supporting, free from debt, with 1,600 members, of whom 700 were in regular attendance at its day and evening classes, and with a library of 1,300 volumes, the building which it occupied for a quarter of a century (let it be remembered for the credit of Manchester that it was the first erected in this country for such a purpose), was found inadequate to meet the demands of a growing community, and an appeal was made for assistance to enable them to provide accommodation for those to whom, from lack of space, they were under the necessity of refusing admittance into the classes. With what success they would perceive. But, however gratifying and instructive the retrospect might be, the conviction that the future welfare of the Institution must depend upon the intelligence and wisdom with which it was conducted, made them especially anxious that at their day of opening they should be surrounded by some of the most distinguished friends of popular education, that expression might be given to the most enlightened views on this subject which experience had taught, that their future course might be marked out, and their energies quickened to pursue it; and they ventured to hope that the labours of the season being over, peace secured, and attention again turned to the development of commerce and the improvement of the people, the noble lord who, after so long a life devoted to the public service now directed the councils of the nation (Lord Palmerston), would not withhold his consent to be present on the occasion, and to visit a community which by its industry contributed so largely to the national wealth, and of which he might say with truth that it was in advance of every other in this kingdom in its provision for the social gratification and physical well-being of its industrious classes, as well as for the persevering efforts which it had made to secure for them, and at its own cost, the advantages of a sound education. The kindness with which the noble lord received and assented to their request would not soon be forgotten, and if he (the President) forbore now to make more than a passing allusion to the deep regret with which they lamented the noble lord's absence, it was because he felt that the domestic bereavement which was its cause forbade them to dwell upon their own disappointment. They hoped, however, that the visit was only postponed, and that hereafter, under happier circumstances, and at no very distant day, the Institution might have the gratification of welcoming him within its walls. The Exhibition they opened to day was the fifth which had been undertaken and successfully carried out by the directors of the Institution. Their fame had long gone by, eclipsed by the grander conceptions of later times, yet Manchester might recollect with pride that she was the first to set the example of these industrial exhibitions, and that the announcement which the directors were able to make at the conclusion of the first — now 20 years ago — that, after having been visited by upwards of 60,000 people, it had closed without wilful injury to any single article exhibited—led to the opening of the Museum and other Institutions in Manchester, and was the circumstance upon which Mr. Hume, in the House of Commons, founded his motion for the opening of the British Museum. It was no prominent part of their scheme to provide mere amusement; but they did not think it inconsistent with the higher objects to which they proposed hereafter to devote themselves to endeavour, by exhibitions such as this, to awaken new and nobler tastes, to excite curiosity and inquiry, to emancipate the heart from false pleasures, that it might be open to the reception of new—in short, to give a desire for knowledge by presenting it in an attractive form. After expressing a wish that this exhibition, though on a humbler scale, might supply a want to the working classes which they could not attain through the greater and nobler efforts at London, Paris, and Dublin, the President concluded by announcing that the Exhibition was open, and the company were at liberty to pass at pleasure through its various departments. The opening ceremony concluded with a concert.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette September 5th*, 1856.]

Dated 15th August, 1856.

1907. John Burns Smith, Manchester—Certain improvements in machinery for preparing, spinning, and twisting cotton and other fibrous substances.

1909. Henry Alfred Jowett, Sawley, Derbyshire—Improvements in rails and railway chairs, and in the construction of railways.

1911. Charles Richard Skinner, St. John's, Worcester—Certain improvements in tanning and finishing off leather.

Dated 16th August, 1856.

1913. William Tranter, Birmingham—Improvements in fire-arms.

1915. George Slater, John Williams, and Septimus Whitaker, Burnley, Lancashire—Certain improvements in power looms for weaving.

1917. John Weir Draper Brown, Burrel's Hotel, London-bridge, and George Gibson Brown, Deptford Dockyard—Improvements in signal lanterns.

1919. Samuel Lilley, Birmingham—Improvements in the manufacture of ships' iron work, a part of which improvements is applicable to the manufacture of other articles in iron.

1921. Louis Auguste Joyeux, Marseilles—Improvements in obtaining motive power.

Dated 18th August, 1856.

1923. Thomas Scott, Barnhill Workhouse, Glasgow—Improvements in cooking.

1925. William Edward Newton, 66, Chancery-lane—Improved machinery for cutting and finishing metal screws. (A communication.)

1927. William Edward Newton, 66, Chancery-lane—Improved machinery for forging or working iron and other metals. (A communication.)

1929. Richard Archibald Brooman, 166, Fleet-street—Improvements in stopping or retarding railway carriages and trains, and in preventing carriages running off the rails. (A communication.)

1931. Charles Marie Chouillon, Paris—Certain improvements in thinning or shaving tawed, tanned, or dressed skins.

Dated 19th August, 1856.

1933. Henry Forfar Osman, 33, Essex-street, Strand—An improved electric clock. (A communication.)

1935. Edwin Sutton, 204, Regent-street—An improved construction of stereoscope.

1937. Robert Jobson, Wordsley—Improvements in apparatus for pouring iron or other metal into moulds.

1939. Joseph Brouard and Joseph Hubert, 39, Rue de l'Echiquier, Paris—Certain improvements in reefing the sails of ships or vessels.

1941. William Edward Newton, 66, Chancery-lane—An improvement in valves for steam engines. (A communication.)

Dated 20th August, 1856.

1943. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in steam engines. (A communication.)

1945. Thomas Sagar and Christopher Turner, Burnley, Lancashire—Certain improvements in power-looms for weaving.

1947. William Gossage, Widnes, Lancashire—Improvements in obtaining sulphur and metals from certain ores and other compounds of metals.

1949. William Stones, Greenhithe, Kent—Improved machinery for damping sheets of paper intended to be printed upon, so as to render the usual operation of wetting unnecessary.

Dated 21st August, 1856.

1952. Joseph Crossley and James Bolton, Halifax—Improvements in apparatus or means employed in the printing of yarns for carpets and other fabrics.

1956. Robert Kenton, Birmingham—A new or improved manufacture of fishing reels.

1958. George James Farmer, Birmingham—Improvements in machinery to be used in the manufacture of chain links, buckles, buckle slides, rings, and other similar articles.

Dated 22nd August, 1856.

1960. William Patten, 22, Old Fish-street, Doctors'-commons—An improvement in apparatus for supplying water to the basins of water-closets and other vessels.

1962. William Edward Newton, 66, Chancery-lane—Improved machinery for cutting chenille. (A communication.)

Dated 23rd August, 1856.

1964. Frederick Albert Gatty, Accrington, Lancashire—Certain improvements in dying.

1966. Edward Hallen, Cornwall-road, Lambeth—Improved means for washing wool.

1968. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in casting metals. (A communication.)

1970. Etienne Sterlingue, Paris—Improvements in preparing for tanning, and in tanning hides and skins.

1972. George James Farmer, Birmingham—Improvements in hardening iron and steel.

1974. Samuel Stocks, Collins Green, near Warrington—Improvements in reaping machines.

Dated 25th August, 1856.

1946. Charles Clark, Somerset-terrace, Albion-road, Stoke Newington—Improvements in combining and arranging looking glasses for toilet purposes.

1948. Jules Laleman, Lille, France—Improved machinery for combing flax and other fibrous materials. (A communication.)

1950. Joseph Maudslay, Lambeth—Improvements in steam engines, especially applicable to screw propulsion.

1976. Marc Antoine François Mennons, 21, Rue Napoléon Montmartre—A new composition applicable to the coating or covering of metallic and non-metallic surfaces. (A communication.)

1978. Pierre Philippe Celestin Barrat and Jean Baptiste Barrat, Paris—Improvements in steam-digging apparatus, suitable for draining and excavating purposes, parts of which are applicable to reaping.

1980. William Frederick Plummer, St. Mary's Overy Wharf, Southwark—Improved apparatus applicable to the grinding of grain and other substances.

Dated 26th August, 1856.

1984. William Henry Perkin, King David Fort, Middlesex—Producing a new colouring matter for dyeing with a lilac or purple colour, stuffs of silk, cotton, wool, or other materials.

1986. Joshua and Thomas Horton, Birmingham—An improvement or improvements in the manufacture of paper, pasteboard, and pulp.

1938. Edward Alfred Cowper, Great George-street, Westminster—An improvement in the manufacture of candles.

1990. Edmund Simpson, Preston, Lancashire—An improved safety cage for mines and pits, or apparatus to be fitted to cages to prevent accidents from the falling thereof.

Dated 27th August, 1856.

1994. Louis Horrie, Keighley, Yorkshire, and James Schofield, Rochdale, Lancashire—Improvements in the mode or method of extracting oil and grease separately from suds used in washing flannel and other woollen goods, for distilling the said grease or other fatty matters, and in the apparatus employed therein.

1996. John and William Moore, Aston, near Birmingham—A new or improved tap or stop-cock.

1998. Samuel Roberts, Hull—Improvements in regulating the supply of steam to engines working screw or submerged propellers, and in regulating or relieving the pressure of steam on slide valves.

2000. Alfred Vincent Newton, 66, Chancery-lane—Improved machinery for combing fibrous substances. (A communication.)

2002. William Green, George Holloway, and Thomas Grubb, Kidderminster—Improvements in the manufacture of rugs.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

2011. Edward Poitiers, 12, Malden-terrace, Haverstock-hill—The application of a new material or materials for the manufacture of brooms and brushes in general and for other purposes, and for improvements in the manufacture of street scavengers' and other brooms and brushes.—29th August, 1856.

WEEKLY LIST OF PATENTS SEALED.

Sealed September 5th, 1856.

565. Robert Morrison.
574. Thomas Cook.
575. Henry B. Young.
576. Henry Cooke.
587. Alexandre Tolhausen.
590. Oliver Maggs.
603. John Northcote Ryder.
610. Isaac Dixon.
635. Charles Benjamin Normand.
653. Augustus Dacre Lacy.
681. John Hinks and George Wells.
697. William Pitt and Edwin Turner Davies.
717. Alexandre Tolhausen.
718. Alexandre Tolhausen.
725. James Rock, jun.
730. Alexandre Tolhausen.
741. Joseph Auguste Barratte.
762. Charles Benjamin Normand.
767. Charles Durand Gardissal.
996. William Gossage.
1013. John Hick.
1027. William Edward Newton.
1239. Thomas Herbert and Edward Whitaker.
1343. William Watson Hewitson and William Hamond Bartholomew.
1419. William Henry Barlow and William Henry Woodhouse.
1583. Lorenzo Blackstone.
1587. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot.
1588. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot.
1589. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot.
1590. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot.
1595. William Laing.

Sealed September 9th, 1856.

581. Pierre Denis Nelot.
586. Joseph Davy and John Milnes.
608. Joseph Sturge and Alfred Sturge.
609. George Rees.
652. Thomas Richardson and George William Jaffreys.
692. James Robertson.
750. Alfred Trueman.
788. William Roberts.
1040. Richard Pearcy.
1188. George Wilkinson.
1439. Charles Edmond Green.
1490. Henrich Ludwig Buff and Frederic Versmann.
1504. David White.
1568. Hilton Greaves.
1618. Rudolph Bodmer.
1688. Francis Barber Howell.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

September 1st.

2119. James Hill Dickson.
2171. Charles Collins.

September 3rd.

2046. William Edward Newton.
2052. James Davis and Robert Ramsay.
2092. John Grist.

September 4th.

2042. John Clare.
2097. Robert Tronson.

September 5th.

2076. Michael Leopold Parnell.
2326. William Beardmore and William Rigby.

September 6th.

2058. David Law and John Inglis.
2065. Robert Harrington.